Anaesthesiology: From the past to the new millennium

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door

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Mijnheer de Rector, ladies and gentlemen,

In 1935, almost exactly 65 years ago, Lundy published the first article about Thiopentone or Penthothal, the new intravenous anaesthetic agent. A coincidence that this publication occurred on my actual birthday. Some form of predestination perhaps? However I only discovered this fact just recently when reading for this address. Thiopentone was the first intravenous induction agent which gained general acceptance in both the United States and Britain; it is one of the few anaesthetic agents which is, after 65 years, frequently used today; it heralded the start of intravenous anaesthesia.

In those intervening years, since Pentothal's introduction, anaesthesiology has had an enormous influence on the development of surgery, making what in the past seemed to be impossible, feasible, and today routine. For instance, who could have forecast then that in the last decade successful open heart surgery could be routinely accomplished in octagerians. Anaesthesiology has stood at the very beginnings of intensive care medicine; anaesthesiologists started pain clinics for the management of benign and cancer pain. Anaesthesiologists were present at the very foundation of trauma teams or acute medical teams; they pioneered many aspects of acute resuscitation. This has resulted that, in many life threatening medical situations in hospital and outside, the presence of the anaesthesiologist is essential.

It is not commonly known by the public or medical colleagues that about two thirds of all patients in a modern large general or university hospital will in some way be in the care of an anaesthesiologist. Many patients are unaware of the ubiquitous hospital presence of their medical carer and protector, the anaesthesiologist; this is understandable for they often have limited conscious contact with him. The use of an analogy may illustrate this: the analogy of anaesthesia and flying. There are many similarities in the routines, disciplines and responsibilities, as I discovered when discussing flying with my brother in law who has been piloting 747 jets around the world for more than 20 years. The passenger sees the pilot before take-off in his cockpit surrounded by an enormous number of knobs and dials; then the pilot in a confident and reassuring way informs the passengers about the flight; the aircraft takes off. Thereafter, often without any further conscious contact with the pilot, the aircraft lands safely several hours later. While the passenger slept or relaxed the pilot was busy flying the plane over inhospitable terrain and through hazardous conditions. This can be compared to an anaesthesiologist who, after a short reassuring preoperative talk with the patient protects, adjusts and controls the patient's homeostasis throughout the noxious stimuli of surgery so that the patient will survive and be able to maintain himself after the operation.

I used the analogy of anaesthesia with flying in my professorial inaugural address in Maastricht more than 10 years ago. 'Angst voor anesthesie' - 'Fear of anaesthesia' - was the title. During that address I related patients, who are very scared with the thought of their first general anaesthesia, with passengers who are terrified of their first flight. Both groups are frightened of relinquishing their control over their own environment and giving themselves over to another persons control. Thus it is not surprising to discover that often patients who are inordinately scared of general anaesthesia are also terrified of flying. Treatment is similar: full information and a reassuring discussion. A sedative can also help. These comparisons made me consider that the title for this address could be: 'The anaesthesiologist: your medical pilot through surgery'. In view of the custom of using cryptic titles or the clever use of words for the titles of inaugural addresses and exaugural addresses a number of other possibilities have also passed review: 'Anaesthesia from an art to a science'; 'The challenge of anaesthesia: survival of the sickest'; 'The anaesthesiologist: Jack of all trades - master of some'. All these titles do, in some part, reflect the development of our profession but in the end the title 'Anaesthesiology: from the past to the new millennium' I considered to be most appropriate for the message I wanted to bring with this exaugural address. But, to do full justice to this subject, would considerably exceed the confines of this address.

I have been fortunate in my career to have met and worked with some leaders in the fields of both anaesthesiology and surgery. I shall use these pioneers to illustrate the development of anaesthesiology in the 38 years that I have been in the profession.

Anaesthesiology from art to science

In the early 1960's at Westminster Hospital, where I started my specialist training the administration of anaesthesia was more of an art than a science. In the whole of the central operating room complex there was one mechanical ventilator and one ECG machine. Monitoring of the patient was with the finger on the pulse and regular and frequent blood pressure measurements with the oscillotonometer or mercury column and cuff. Apart from these direct measurements teaching was directed at observation of patient signs: pupil size, breathing rate and depth, the slightest muscle movement or facial muscle twitch, a tear or beads of sweat. Even the presence of a warm nose or cold toes. This was how we evaluated the patients somatic and autonomic response to the noxious stimuli of surgery. Clinical pharmacology was based only on pharmacodynamics - what the drug did to the patient. The anaesthetist used his senses to administer anaesthesia. Using the analogy of anaesthesia with flying: anaesthetising by touch, sight and feel or flying by the seat of his pants.

In the middle decades of the last century Westminster Hospital in London was renowned as a world pioneer in the development of anaesthesiology. Illustrious names worked at Westminster like the late Professor Sir Geoffrey Organe, my teacher, and Dr. Stanley Feldman who was later to become the Magill Professor of anaesthesia at Westminster Hospital. Sir Ivan Magill, although in his early seventies, used to attend there regularly. Once he told me how he had developed the endotracheal tube that bears his name. In 1939 at the start of World War II the demands of a safe airway as well as artificial ventilation of the lungs required a device to enable this. Magill experimented with rubber tubing but in those early years of the war he was unable to find a suitable source of supply. In desperation he went to the local hardware store where he bought several metres of household quality red rubber tubing. Unfortunately this was too rigid, straight and inflexible for anaesthetic use. Winding the red rubber tubing around his waist he continued his daily anaesthetic duties at Westminster Hospital. After a few months the red rubber tubing had been cured and was pliable and he cut off a length as required. Furthermore the tubing had a permanent curve which he found facilitated endotracheal intubation. Quite a portly man, Magill told me "the curvature of the endotracheal tube reflects my waistline, my boy!". And so it has remained until into the new millennium.

The development of anaesthesia was more esoteric. Magill was an outstanding clinical innovator. The Magill anaesthetic attachment, the Magill forceps and the Magill endotracheal tube one will find today in the modern anaesthetic induction room. Magill had also invented a laryngoscope to enable endotracheal intubation and an intubating bronchoscope. I used this early in my training years to correctly position single-lumen endobronchial tubes. So, what is today considered to be 'state of the art' practice in the correct positioning of endobronchial tubes, that is checking the placement with a fibreoptic bronchoscope, we were practising more than 35 years ago.

Scientific development was hampered by the materials available: metal intravenous needles like the Gordh and Frankis-Evans did not facilitate venepuncture and could not remain long in veins. Red rubber catheters, endotracheal tubes and intravenous infusion sets quickly resulted in local irritation, and, in the case of intravenous infusions, phlebitis. Glass blood and intravenous fluid bottles and glass syringes were fragile. All this anaesthetic equipment was cleaned after use, then sterilised and used again. The advent of man-made materials into medical practise in the mid 60's had a significant beneficial effect on anaesthetic morbidity and mortality. These plastic materials were less toxic and irritant; they were less breakable and more pliable. Their introduction promoted the further scientific development of anaesthesiology.

Clinical pharmacology and clinical physiology were being applied to anaesthesia. New anaesthetic drugs were being introduced which had less side effects with a greater therapeutic index and a pharmacological profile that made them more titratable.

Instead of the arrow - poison derived muscle relaxant tubocurarine - alloferin and pavulon. Instead of the slow onset and long acting morphine, the new opioid fentanyl; halothane instead of ether and trilene. Both these latter inhalational agents were demoted to degreasing agents and spot removers. However, although other hypnotics were introduced like methohexital, thiopentone maintained its place as the most popular induction agent. Hypnotics which cause sleep, muscle relaxants and opioids which relieve pain and modify the stress response to noxious stimuli are the basis of the triad of anaesthesia viz. hypnosis, muscle relaxation and pain relief. Adjustment of these three anaesthetic components were balanced to produce unconsciousness to facilitate surgery, to protect the patient from the stress response and to enable a rapid postoperative return of the patient's self protecting reflexes and consciousness. Balanced anaesthesia as this technique was called was refined in the 60's and 70's and has remained an important modern anaesthesia technique into the new millennium.

Demands of surgery required the skills of the anaesthesiologist, as clinical pharmacologist and clinical physiologist, to provide conditions so that the most delicate neurosurgery as well as major cardiothoracic surgery could take place. Controlled hypotension was induced during anaesthesia using direct vasodilatation and indirectly acting ganglion blockers. The bloodless field that this technique provided promoted the advance of microsurgery of the head and neck.

During both cardiac anaesthesia and neuroanaesthesia hypothermia was used to reduce the oxygen and metabolic demands of the patient so that surgical access was possible whilst circulation was compromised or absent. The depth of hypothermia was an indicator of the allowable time of total circulatory arrest. A core temperature of 18° C gave a total circulatory arrest time of 30 minutes. Raised atmospheric pressure - (hyperbaric medicine) was used to augment the supply of oxygen to tissues in compromised situations. Open heart surgery as carried out in a pressurised chamber operating room at 1 atmosphere above ambient; patients with carbon monoxide poisoning responded well to hyperbaric oxygen. One of my duties during my training was to run an individual - one person - hyperbaric oxygen chamber. This Vickers chamber looked rather like a miniature power racing boat. Outside the chamber I pressurised patients to 2 atmospheres to facilitate radiotherapy treatment or to treat carbon monoxide poisoning. Knowledge of the physical properties of gases was essential especially during rapid depressurisation.

These techniques were important for the scientific development of anaesthesiology. Not all have stood the test of time. Nevertheless the knowledge accumulated could justify the title of the textbook of anaesthesiology first published in 1970 and edited by two of my teachers, Dr. Scurr and Dr. Feldman. Scientific Foundations of Anaesthesia.

Anaesthesiology and Intensive Care

The anaesthesiologist's competence during surgery is the maintenance of a patient's vital functions: respiration, cardiovascular stability, fluid, blood and endocrine homeostasis.

At my teaching hospital in London in the early 60's there were few facilities to continue this care after surgery in sicker patients with compromised pulmonary or cardiovascular systems. However, mechanical ventilators were becoming available. These were simple in design and were initially described as mechanical hands. There was the bag-in-bottle type, like the first specifically designed ventilator: the Engstrom. Also the rubber bellows type with the tidal volume adjusted with weights like the East-Radcliffe ventilator which was popular at Westminster Hospital. Postoperative respiratory support was on an 'ad hoc' basis in those early days. The patient was mechanically ventilated where a space and a spare nurse could be found using a ventilator borrowed from the central operating room complex.

This unsatisfactory situation could not be maintained for long and a respiratory intensive care unit, with dedicated staff and mechanical ventilation (East-Radcliffe/Manley and BIRD), was opened in 1964. That was 10 years after Bjorn Ibsen had established the first anaesthesiology and intensive care department at the Kommune Hospital in Copenhagen. I worked in his department for a few months in 1967-8, as a fellow in anaesthesia and intensive care; after completing my training in England.

Bjorn Ibsen, an anaesthetist in Copenhagen was the man of the moment during the polio epidemic in Denmark in 1952. His insight and application reduced the mortality rate of respiratory and bulbar polio from 90% to 25% saving hundreds of lives.

Whilst working with him in Copenhagen he revealed to me how this had happened. A negative pressure total body respirator 'the iron lung' and the cuirass ventilator were used to treat polio patients with both bulbar and respiratory paralysis. In spite of this negative pressure artificial ventilation 90% died; these deaths were thought to be inherent in the particularly viscous disease process. Bjorn Ibsen thought otherwise. He had become acquainted with a new apparatus that measured carbon dioxide continuously, the Brinkman Carboviser. With this he had measured the carbon dioxide content of expired air during thoracic operations and had become fully aware of the adverse effects of carbon dioxide accumulation.

Iron lung patients were given oxygen to enrich their dwindling supply of air due to inadequate ventilation but this hypoventilation allowed carbon dioxide accumulation.

Ibsen stated that these patients had developed respiratory acidosis and were dying from carbon dioxide narcosis. This central depressant effect compromised their ability to maintain their airway and clear secretions during negative pressure ventilation.

A few months before the polio epidemic he had treated the muscle spasms of a neonate with tetanus by giving the muscle relaxant curare and positive pressure ventilation via a tube in a tracheostome. Similarly he advocated tracheostomy and manual positive pressure ventilation for the paralysed polio victims. A young girl of 12 was Ibsen's first patient. During tracheostomy the dying girl struggled and completely obstructed. A small dose of Pentothal allowed Ibsen to gain control over the airway. Pentothal saved the day he later confided to me.

Hundreds of medical students were mobilised to provide the manual ventilation using a rubber bag and a carbon dioxide absorber system. With this many patients survived the 2-3 months bulbar and respiratory paralytic polio period.
Two other important developments for anaesthesia and intensive care were initiated by this polio epidemic. Poul Astrup used the brand new Radiometer pH electrode to measure the pH of the ventilated patient's blood, thereby assessing respiratory acidosis and also initiating the science of blood gas analysis. Engstrom's prototype ventilator was produced in enough numbers in Sweden to provide mechanical positive pressure ventilation to combat the Swedish polio epidemic in 1953.
The competence that Ibsen had shown in treating respiratory failure outside the operating room firmly established the important role that

the anaesthesiologist could perform in treating the critically ill in the intensive care unit.

Following Copenhagen I worked the summer of 1968 in the intensive care unit at the Kommune Hospital in Aarhus, Denmark. Henning Poulsen, an anaesthesiologist, ran the unit. He was known for the impetus he gave to the international development of intensive care medicine. He was very emphatic in his opinion of the medical management of the unit. He told me that it was essential that in the intensive care unit the doctors who provided and gave the patient care must also have the medical responsibility and run the intensive care. Who provides the care must run the care. I have always supported this dictate.

Although my next fellowship in anaesthesia and intensive care was scheduled at the Massachusetts General in Boston I did not take up this position. The very real threat of being drafted and being sent to Vietnam made me change direction and work in Cape Town. Arriving at the Red Cross Children Memorial Hospital in December 1968 it was a surprise to find there a neonatal intensive care unit filled with small mechanical pumps like bicycle pumps. A row of curarised neonates with tetanus were being ventilated via a tracheostomy. The treatment that Ibsen had initiated for a tetanus neonate in Denmark in 1952 was repeated successfully many times in Cape Town. Fortunately now the native custom of applying cow dung to the umbilicus of the newly born in the Cape has stopped.

Multi-disciplinary medical team for multi-organ failure

In 1974, during the nine years that I worked at the department of anaesthesia at Groote Schuur Hospital, I spent one year working in the intensive care unit. It was run buy a Dr. Alec Ferguson, a pulmonologist. The other consultant team members were Dr. Peter Potgieter, an anaesthetist, Dr. Solly Benatar, an internist, and myself. Dr. Benatar had completed his specialist training in both anaesthesiology and internal medicine. He later became Professor of Medicine at Cape Town University. It was here, working with an established multi-disciplinary team, that I realised the enormous benefit that the different specialities in collaboration could give to optimise patient care.

The important lessons from the past were:

The anaesthesiologists competence in the intensive care unit

Those who provide the medical care must run the care

A multi-disciplinary team for multi-organ failure

The intensive care department at the St. Annadal Hospital in Maastricht opened in 1972. Ferd Timmermans, then head of the department of Anaesthesiology and Dr. Witkop, a pulmonologist, were instrumental in starting the unit. Dr. Pop, an internist, and Dr. Lemmens, a surgeon, also completed the multi-disciplinary team. However, when I commenced as head of the department in Maastricht in 1987 there were signs that the unit may be split into two separate units: a surgical unit run by anaesthesiology and surgery and a non-surgical unit run by the internists. This trend intensified and came to a head not long before the opening of the new University Hospital in Maastricht. Would the interconnecting door between the two adjacent nine bed units be closed forever? Fortunately, mainly through the efforts of the department of Anaesthesiology, the door remained open; the collaborative multi-disciplinary approach would remain and become firmly established in Maastricht to this day.

Training and accreditation in intensive care in Europe

Intensive care has not an individual specialist status in Europe except in Spain. The Spanish Government, because of inaccurate advice, decreed it should have this status; this does not reflect the views of most Spanish intensivists who have recently approached their Government to revoke this decision. A European Union Committee, which advises the various European Commissions about specialist training, named the ACMT (Advisory Committee on Medical Training) also considered that intensive care should have speciality status in the Union; again due to incorrect advice from national public health officials. However, due to actions by the Section Anaesthesiology of the European Union of Medical Specialists (UEMS) this status will not be given. The UEMS, which celebrated its 40th anniversary of founding in 1998, was established, in the first instance, to promote the free movement of specialists throughout the

European Federation. The harmonisation of specialist practise and training are the current aims in the European Union.

To this end specialist sections were formed. Since 1987 I have been The Netherlands representative in the UEMS for the Section of Anaesthesiology, Reanimation and Intensive Care. In 1997 I was honoured to be elected President of this Section. When I took office I was confronted with the problem of harmonisation within the field of intensive care. I should add that in the past intensive care had been allocated to Anaesthesiology: in recent years experience showed that this field of interest was evident in other Sections. The danger then existed that separate European Sections would develop, independently, their own training structures and accreditation requirements, each reflecting their own Section's background speciality. This had already occurred in the United States where intensive care training programmes are provided by different specialist bodies: anaesthesiology, medicine, surgery and paediatrics. Not a multi-disciplinary approach but a multiple sub-speciality one with no common core curriculum.

In Europe, a few countries had formed a national multi-disciplinary approach to the teaching, accreditation and the practise of ICM; the Netherlands formed the Gemeenschappelijke Intensivisten Commissie (GIC); in Germany the Deutsche Interdisziplinaire Vereinigung für Intensiv- und Notfallmedizin (DIVI) brought together the participating specialities for a combined approach.

Following a great deal of preparatory work in the Anaesthesiology Section and with much lobbying and persuasion, the UEMS Sections Anaesthesiology, Surgery, Internal Medicine and Paediatrics came to a consensus decision. The Multi-disciplinary Joint Committee on Intensive Care Medicine (MJCICM) was established on March 19th 1999 in Brussels. I was honoured to be elected to chair this committee. Also elected to be the Honorary Secretary was Prof. Dr. Hugo van Aken (Münster) who has given great assistance in initiating and establishing the MJC.

The European Society of Intensive Care Medicine (ESICM), the most important multi-disciplinary professional body on ICM in Europe, had been consulted before establishment of the MJCICM. They were asked to form a multi-disciplinary permanent advisory board in the MJC. True to our request Prof. Dr. Graham Ramsay (Maastricht), a surgeon, Prof. Dr. Jean Carlet (Paris), an internist and Prof. Dr. Hilmar Burchardi (Göttingen), an anaesthesiologist, have formed the advisory board as executives from the ESICM.

The MJCICM is at present establishing training guidelines. It is preparing protocols for visits to European units for accreditation purposes. These visits will help to promote harmonisation of intensive care medicine within the European Union and even beyond those borders. Further to implement the conviction of Henning Poulson 'those who provide the medical care should run the care' access and training should be available to all specialities participating in intensive care medicine.

The management council of the UEMS has not only approved of the multi-disciplinary joint committee construction but has recommended our set-up for other medical services with a multi-specialist interest like oncology.

In the UEMS Section Anaesthesiology we are working to establish chronic pain therapy as a MJC structure.

Cardiac surgery and anaesthesia

In the early 60's during my training years at Westminster Hospital I worked with Charles Drew, a cardiac surgeon who was a brilliant innovator. His technique for extra-corporeal circulation was performed by separate right and left circulation pumps. Oxygenation was performed by the patient's own lungs, so called native oxygenation. Patients were cooled to 15° C and the cardiac surgery was performed during 30-40 minute periods of total circulatory arrest. Patient monitoring was by ECG and multi-lead EEG; temperature measurement was also multiple. Direct patient haemodynamic monitoring was a blood pressure cuff or oscillotonometer.

Apart from giving a standard balanced technique of anaesthesia - hypnosis, analgesia and muscle relaxation, which provided unconsciousness and stopped shivering, the anaesthetist provided only limited protection against the enormous stress of cardiac surgery with extra-corporeal circulation and deep hypothermia. Consequently only children and young adults were able to survive these operations.

Drew's technique faded with the development of extra-corporeal circuits which included adequate oxygenation. The bubble followed by the more efficient and compact membrane oxygenator.

In the new millennium there is a new interest in coronary artery surgery performed without cardiopulmonary bypass. Beating heart surgery without cardiopulmonary bypass is less invasive and can reduce exitatory metabolic, inflammatory thrombogenic and thermal stress for the patient reducing morbidity and mortality. It is estimated that in the United States, in this millennium year, about 30% of the 300.000 cardiac operations will be performed as beating heart coronary artery bypass grafting surgery. Anaesthesia for this type of surgery brings very exacting demands from the cardiac anaesthesiologist. Optimum control of the patients cardiovascular system yet with maximum reduction of the stress response to the noxious stimuli of surgery is essential for the success of these operations. To facilitate this procedure the continuous measurement of the pulmonary artery mixed venous saturation and continuous cardiac output are very important patient monitoring devices.

Transoesophageal echocardiography also provides direct information of the contraction and performance of the heart. Highly potent specific and easily titratable anaesthetic drugs used with skill are required to obtain optimum results. However for full revascularisation of the heart assist devices are often necessary especially if the heart has to be tilted out of the pericardial cavity.

At the University Hospital of Maastricht I have been assisting the cardiac team in evaluating a right heart assist device called the Enabler. Later this year we shall be assessing the performance of another device called the Impella. The added advantage is that this assist device can not only assist the low pressure side of the heart but also the left, high pressure side. This left pump facility is important for optimum support of the compromised heart. In this way the lungs function as native oxygenators and, with the two external cardiac pumps, the Drew technique has returned from the past into the new millennium.

Heart transplantation

After the Red Cross Children's Hospital I started working at the Groote Schuur Hospital in 1969. Dr. Dave McConnell, an anaesthesiologist now working in Australia, started working there at that time as myself; he is in the audience today.
The first heart transplantation operation had already taken place in 1968. Whilst working at Groote Schuur Hospital I was privileged to join Professor Christiaan Barnard's heart transplantation team. A brilliant surgeon who had the rare ability of adapting surgical techniques to unexpected cardiac abnormalities during the operation. He also expected the very highest standards from his team.
I was anaesthetising for a particularly complicated heart transplant procedure, the biological assist heart or the double heart transplant.

Here the donor heart was transplanted next to the failing recipient heart. Once sutured together and their action synchronised both hearts worked in parallel. Then, in time, it was found that the recipient heart could recover and fully take over. A biological temporary assist device before mechanical ones were available.

During a crucial stage of the operation Barnard demanded from me an analysis of the ECG of both hearts. It was a double jumble and I failed. Looking at both beating hearts in situ was more revealing!

The transplanted patients had undergone enormously stressful operations and the available anaesthetic technique only gave partial protection. This resulted in little modification of the exitatory and inflammatory process so that a rejection process could be more easily initiated. Haemodynamic monitoring was advancing so that during transplant surgery the anaesthesiologist had a direct measurement of radial arterial pressure and also the central venous pressure. No strain gauges but direct mechanical measurement with manometers and volume of fluid.

In the past 30 years cardiothoracic anaesthesia has initiated the use of many patient measurement and haemodynamic monitoring techniques to meet the increasing demands of surgery: direct peripheral arterial pressure measurement, central venous pressure, pulmonary artery and wedge pressure, continuous cardiac output, trans-oesophageal echocardiography, differential and single lung ventilation. These techniques are now routine in cardiac anaesthesia but have also influenced other branches of anaesthesia; anaesthesiologists have adopted these monitoring techniques to assist them in other types of major surgery. Their use has also extended into the intensive care unit.

When I left Groote Schuur Hospital in 1977 for Leiden heart transplantation was marking time there. Professor Barnard could no longer operate; new anti rejection drugs were needed as well as stress reducing anaesthetic techniques and intensive care management.
The present status and future of heart transplantation will be presented at the symposium tomorrow by Dr. Ray Latimer, an anaesthesiologist from a transplant centre in England.

Combating the stress response to cardiac surgery

Very high doses of morphine, or morphine-like synthetic drugs called opioids, were found to be effective analgesic/anaesthetic drugs in reducing or modifying the stress response to cardiac surgery. These very high doses are safe when used during anaesthesia; they have a high therapeutic index.
Lowenstein had success with doses of morphine 1 mg/kg in very sick patients undergoing heart valve surgery in the early 70's. This technique was less successful in younger fitter patients undergoing coronary artery surgery. In 1976 Professor Ted Stanley showed that fentanyl, a synthetic opioid 100 times more powerful than morphine, could, in doses of 50-100 mcg/kg, be an effective

analgesic/anaesthetic during coronary artery surgery. High dose opioid anaesthesia was born.

Professor Spierdijk was successful in bringing Professor Stanley to Leiden University Hospital in 1979 as research Professor for one year. It was during this time that Professor Stanley and myself worked together in evaluating two new opioids for cardiac anaesthesia. Paul Janssen, the brilliant Belgian chemist and the founder of Janssen Pharmaceutica, had developed both sufentanil and alfentanil from fentanyl and had pharmacologically tailored these opioids for anaesthetic use. We were the first to use these opioids for cardiac anaesthesia; this evaluating work resulted in my thesis in 1982: "Stress responses to cardiac anaesthesia: modifying effects of alfentanil and sufentanil anaesthesia"; Professor Spierdijk was my promotor and Professor Stanley co promotor.

Sufentanil, ten times more powerful than fentanyl is a very safe drug but so potent it can anaesthetise both mouse, man and elephant as has been demonstrated by Professor Stanley. It has become widely used especially in the States for cardiac anaesthesia.

Alfentanil has a much faster onset than other opioids but a considerably shorter duration of action; when we first used it in cardiac anaesthesia in bolus form and due to its short action it was difficult to maintain an optimum depth of anaesthesia. Necessity is the mother of invention. By drawing up all the ampoules of alfentanil into one large syringe we developed a technique for a continuous infusion of alfentanil. This provided a smooth flexible and effective

Training and Continuing Medical Education

In Europe, in the early 80's, there were few professional bodies in anaesthesiology who could provide continuing medical education. For instance to obtain state of the art information about cardiothoracic anaesthesia one had to travel to the United States to the annual meeting of the Society of Cardiovascular Anesthesiologists. Once there one could discuss with European colleagues about research and developments in neighbouring EU countries.

In Leiden in 1985 at a Boerhaave meeting, Norbert de Bruijn and I helped to motivate the formation of a European body of cardiothoracic anaesthesiology. In June of the following year the European Association of Cardiothoracic Anaesthesiologists (EACTA) was founded. As chairman I helped to nurse EACTA through the initial 6 years and was pleased to hold the 7th annual meeting in Maastricht. I am honoured that the subsequent EACTA chairmen are here today. Professor Hans Sonntag from Göttingen, Professor Olav Sellevold from Norway and the present chairperson Professor Edith Schmidt from Zürich.

Our millennium meeting, the 15th annual meeting, will be held in June in Aarhus, Denmark. In the first 10 years the annual EACTA meeting was largely a forum for presenting European research with a few state of the art lectures. Since 1996 EACTA has followed European demands and has provided a full programme of continuing medical education. A new progression from this concept is continuing professional development which includes a greater 'hands-on' participation in training. In this respect EACTA has for several years organised workshops and training sessions in intra-operative echocardiography. Simulator training has also been introduced.

Airline pilots have long been trained in simulators where difficult and dangerous flight situations can be reproduced in a very life-like way without any danger to passengers or plane. A real-life scenario must be simulated with debriefing sessions. Similar to airline pilots anaesthesiologists can also benefit from full-scale simulator training; rare or unusual anaesthetic situations can be experienced where there is often lack of precompiled procedures by using real-time anaesthesia simulators. In full-scale simulator training the patient, the ventilator, the monitoring and the crisis situation is mimicked in an authentic operation room setting. A video is taken of the trainees and the debriefing is essential. The only full-scale unit in The Netherlands is present in Leiden University Hospital. In the millennium training requirements of the Nederlandse Vereniging voor Anesthesiologie it has been decided that all the assistants in training will be required to experience an annual simulator session. I hope in the future that these simulator sessions will be available to all anaesthesiologists.

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The representatives and Board of the European Association of Cardiothoracic Anaesthesiologists, thank you for your friendship, enthusiasm and support for the development and success of EACTA.

Hooggeleerde heer Spierdijk, beste Han, ik wil ook jou bedanken. Jouw visie hulp en ondersteuning heeft mijn academische carrière in Leiden en Maastricht mogelijk gemaakt.

Het bestuur en alle leden van de commissies van de Nederlandse Vereniging voor Anesthesiologie waarmee ik heb gewerkt bedank ik voor de vriendelijke en prettige samenwerking.

Hoogleraren Anesthesiologie en opleiders. In de 13 jaar als hoogleraar heb ik met jullie een heel constructieve en vriendelijke samenwerking gehad. Het Convent van Opleiders is een prettige, doeltreffende commissie geworden binnen onze vereniging.

Mijnheer de Rector Magnificus, leden van het Bestuur van de Universiteit Maastricht, mijnheer de Decaan en leden van het

Faculteitsbestuur en de Faculteitsraad, de Raad van Bestuur van het academisch ziekenhuis Maastricht. U wil ik danken voor het feit dat u mij 12,5 jaar de mogelijkheid geboden heeft om een academische afdeling op te bouwen in Maastricht. Na een lange procedure hoop ik dat mijn vervanger op korte termijn benoemd zal worden.

Stafleden van de afdeling Anesthesiologie, collegae en vrienden bedankt voor de samenwerking en collegialiteit. Het vergt veel tijd, inzet en energie om een perifere afdeling om te bouwen in een academische afdeling. Toch is het ons gelukt op korte termijn de opleiding in het azM te beginnen en daarna op te bouwen tot één van de beste van Nederland. Op wetenschappelijk gebied heeft de afdeling de laatste vijf jaar jaarlijks een proefschrift afgeleverd. De afdeling Anesthesiologie is bijna de grootste van het azM, maar zeker de meest complexe.

Dr. M. van Kleef, beste Maarten, ik wil je hier extra bedanken. Jouw grote inzet en 'management flair' is de laatste jaren een enorme steun voor mij geweest. Ik waardeer jouw loyaliteit en vriendschap.

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Oude arts-assistenten en arts-assistenten in opleiding. Ik wens jullie succes. Op jullie schouders berust de toekomst van de anesthesiologie.

Ik heb veel waardering voor het secretariaat Anesthesiologie. Een speciaal woord van dank aan Lilian van Thiel en Patrice Moonen voor hun vriendelijke en voortreffelijke ondersteuning en bijdrage in de opbouw van de afdeling.
My academic career could have not been possible without the love and unfailing support of my wife. Thank you Pella.

For the official last words as Professor I would like to paraphrase a famous statesman: "Think not what your profession can do for you but what you can do for your profession".

Mijnheer de Rector, ladies and gentleman, I have spoken!